

## ***Dropping In a Microgravity Environment***

### **IDEA SPARKS**

Some possible experiments are listed here to spark ideas by the schools. These ideas are meant to be just that - ideas. The team may develop an experiment concept from these ideas or from other gravity-dependent phenomena.

Each experiment will need a ground truth experiment to go along with it. This ground truth experiment could be operated in the educational rig without dropping it to experience the same environment as the dropped experiment or it could be operated at the school's home location.

All types of experiments will need to consider the consequences of the sudden stop at the bottom of the drop tower.

#### NASA Research

##### Conceptual microgravity drop tower experiment

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| Basic Physics | Drop two objects of similar cross section shape but vastly different masses (ping pong ball and golf ball) and observe rate of falling (ala Galileo). With the drag shield, the air resistance should be minimized. This could be compared with dropping the objects from bleachers at school and observing the rate of falling.  |
| Basic Physics | Do two balls fall at the same rate when released at the same time, but one has horizontal velocity and the other doesn't? Should they be released before or after the rig is released?  |
| Basic Physics | Compare rate of rotation of two masses; one evenly distributed and rotated about its center of gravity while the other is rotated around a point away from the center of gravity. Observe rate of rotation in one-g and during free fall and the rate of change of the rate of rotation.  |
| Basic Physics | Observe operation of ordinary devices with stored energy, such as a mouse trap.   |
| Basic Physics | Observe harmonic oscillation of weights suspended between two bungee cords or springs. Vary the mass and bungee cord or spring characteristics.   |
| Basic Physics | Install three magnets in a line with their poles repelling each other. These could be cylindrical magnets in a clear tube or toroidal (donut) magnets on a (non-magnetic) rod. Two sets of these magnets could be used, one installed vertically and one horizontally. What are the relative positions of the magnets before and during the drop?<br>(Caution: Install soft, non-magnetic pads between magnets to avoid |

## MICROGRAVITY DROP TOWER SECONDARY SCHOOL COMPETITION

- breakage at the end of free fall.) Perhaps multiple toroidal magnets on a non-magnetic rod shaped in a circle in a vertical plane.
- Basic Physics** Investigate the difference in operation of a weight-driven pendulum clock, a spring wound escapement clock, an hour glass, and an all-electronic clock. Compare operation before, during, and after the drop tower operation. Implied here is observation of the inner workings of the mechanical clocks as well as their second hands.
- Combustion Science** Ignite a short wick with a small amount of wax attached to a thin wire to investigate combustion of a free drop of fuel in microgravity.
- Fluid Physics** Introduce an Alka-Seltzer (TM) pellet in water which will produce bubbles. What do the bubbles do in microgravity? What happens to the production of bubbles during microgravity?
- Fluid Physics** Float a piece of wood in a liquid chamber with a free surface at the top. Does the wood sink, continue to float, or get rejected from the water during microgravity? Try with different types of wood, some more and less dense, some bare wood others with painted, non-porous surfaces. Try with other materials, such as Ivory (TM) soap, or with different shapes.
- Fluid Physics** Pull a diaphragm from between two liquids as the drop starts. The pair of fluids in a sequence of drops could be different density fluids, different surface tensions, immiscible fluids, and miscible fluids. Perhaps a granular dry powder in one side and a colored liquid on the other.
- Fluid Physics** Investigate water spurting out of a tank from holes at different water depths. How do the water streams from the different levels react when the experiment is dropped?
- Fluid Physics** How does soap or detergent affect the surface shape of a liquid in a container when dropping? (Is there enough of an effect here in 2.2 seconds?)
- Fluid Physics** Investigate the interference pattern of light on a circular soap film during free fall. Will the pattern change when the fluid becomes more evenly distributed in the circular frame (instead of having more fluid toward the bottom?).